

**ECONOMICS 207**  
**FALL 2006**  
**EXAM 3**

**Problem 1** (25 points).

Consider the following matrices.

$$A = \begin{bmatrix} 4 & 3 \\ 3 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & 2 \\ -4 & -3 \end{bmatrix}, \quad C = \begin{bmatrix} -2 & 1 & 3 \\ 3 & 4 & -4 \end{bmatrix}$$

$$D = \begin{bmatrix} -2 & 3 \\ 3 & -4 \end{bmatrix}, \quad F = \begin{bmatrix} 2 & 1 \\ -3 & -2 \\ 1 & 2 \end{bmatrix}$$

$$a = \begin{bmatrix} 2 \\ 1 \\ -1 \end{bmatrix}$$

Compute the following

(i)  $A + B$

(ii)  $AB$

(iii)  $C'B$

(iv) a'F

(v) EA

**Problem 2** (15 Points).

Solve the following system of equations for  $x_1$ ,  $x_2$ , and  $x_3$  by writing the system as an augmented matrix and performing row reduction.

$$4x_1 + x_2 + x_3 = 2$$

$$-2x_1 + x_2 + x_3 = -1$$

$$4x_1 + x_2 + 2x_3 = 1$$

**Problem 3** (20 Points).

For each of the following problems, find the critical points. For each critical point state whether the function is at a relative maximum, relative minimum, or otherwise. Also find the points of inflection for each function.

(i)  $f(x) = x^3 - 2x^2 + x + 1$

(ii)  $f(x) = 3x^4 - 4x^3 + 2$

**Problem 4** (10 points). Calculate the definite integral.

(i)  $\int_1^4 18x^2 + \frac{1}{x} - e^{2x} dx$

**Problem 5** (30 points). The cost function for a firm is a rule or mapping that tells the total cost of production of any output level produced by the firm. If the variable  $y$  represents the output of the firm, then the cost function is given by  $c(y)$ . Marginal cost represents the change in the cost of production for the firm as output changes and is given by the derivative of the cost function with respect to output, i.e., Marginal Cost(MC) =  $c'(y)$ .

- (i) Find the profit maximizing level of output for the following firm. Demonstrate that the level you choose maximizes profit.

$$\text{price} = p = \$300$$

$$\text{cost} = c(y) = 1000 + 27y - 9y^2 + y^3$$

- (ii) What is revenue minus variable cost for this firm when price is \$300?

- (iii) Find producer surplus for this firm assuming you are only given the following marginal cost function:  $MC(y) = 27 - 18y + 3y^2$  and a price of \$300.